

Does the run-up of privatisation work as an effective incentive mechanism?

Preliminary findings from a sample of Italian firms

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Abstract

The main viewpoint related to privatisation is concerned with the aim of verifying the presence of incentive mechanisms on the managerial behaviour. This paper, differently from other earlier studies on this topic, is aimed to study, with an econometric approach, the dynamic of economic performance in the years before privatisation, over a sample of Italian privatised firms in the last decade. The results show an interesting growth in the productivity levels in the four years preceding the shift from public to private ownership. This suggests that other mechanisms than property rights influence managerial efforts. The main source of such improvement can be attributed to the labour factor, in agreement with many theoretical and empirical studies.

Keywords: Privatisation; Productivity; Panel data; Italian firms

JEL codes: C23, D24, L32, L33

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CONTENTS

1. Introduction	7
2. Theoretical framework	7
2.1. <i>Traditional Literature.....</i>	<i>7</i>
2.2. <i>Theoretical background for the pre-privatisation behaviour.....</i>	<i>9</i>
3. Empirical framework.....	14
4. Settlement of the sample and dataset.....	15
5. The econometric model	17
6. Results.....	18
7. Conclusion	22
References	25

1. Introduction

One of the most significant political decision of the last two decades has been the privatisation of State-owned firms. This orientation is mainly explained by efficiency reasons, since it is generally considered that private firms perform better in term of productivity than public ones, with positive relapses on prices of products and services (Zanetti and Alzona 1998). The privatisation policy was accompanied and matched with other political interventions such as liberalisation, deregulation, set in a general process of markets integration. The constraints imposed on public finances by the European unification then has induced the government to sell public enterprises, at least these ones with smaller strategic relevance for public objectives. The privatisation processes have interested almost the totality of industrialised and developing countries, especially the Great Britain.

The economic literature highlights as under private ownership more effective incentive mechanisms operate on managerial and workers efforts, so as to reduce slacks and overcome the difficulties in control, arising from asymmetric information. There is, however, some evidence of increasing performance before privatisation takes place, so demonstrating how productivity can enhance even when firms are controlled by State officers. The suggestion is that the announcement of privatisation can work as a threat for public managers and, thus, as an indirect incentive mechanism that leaves out of consideration the issue of enforcing complete contracts.

This paper is aimed to verify a similar evidence by using a panel data of Italian firms. Section 2 introduces the theoretical framework, section 3 shows the main empirical evidences, section 4 describes the dataset while section 5 introduces the econometric models used. The results are presented in section 6 and section 7 concludes the paper.

2. Theoretical framework

2.1. Traditional Literature

The main viewpoint related to privatisation is concerned with the aim of verifying the presence of incentive mechanisms on the managerial behaviour. Traditionally most theoretical and empirical works have taken into account the efficiency levels of newly-

privatised firms between the years following the privatisation and the previous ones (Boussofiane, Martin and Parker, 1997; Dunsire, Hartley and Parker, 1991; Fraquelli and Fabbri, 1998; Fraquelli and Erbetta, 2000; Hartley, Martin and Parker, 1991; Haskel and Szymanski, 1993a; Hutchinson, 1991; Megginson, Nash and Van Randenborgh, 1994). Other studies have moreover compared performances indicators, such as productivity and profitability, for publicly versus privately-owned firms (De Fraja, 1993; Dewenter and Malatesta, 1998; Pint, 1991; Schmidt, 1996).

The approaches that most directly bear on privatisation are these of *property rights*, *principal agent* and *public choice* (Vickers and Yarrow, 1988; Bös, 1991; Tittenbrun, 1996; Villalonga, 2000). Each of them suggests explanatory keys for the evaluation of the impact of privatisation. We will discuss them briefly.

The *property rights* theory argues that different ownership arrangements can lead to differential incentives on the economic behaviour of the firm. The basic proposition underlying this pattern is that the residual claims of control (that is, the right to appropriate the returns from the assets) represent a strong incentive towards the enhancement of efficiency (Grossman and Hart, 1986; Hart and Moore, 1990, Hart, 1990). Removing the property rights away from the public control could impact positively on productive performance and innovation. According to this theory, incentive mechanisms can work through two typical threats characterising the market for corporate control: the risks of *take-over*¹ and *bankruptcy* (Kay and Thompson, 1986; Vickers and Yarrow, 1988; Trento, 1992; Barca, 1994). In both the cases, a decreasing value of the firm could flow into a replacement of the management, judged unable for the business strategy, by incumbent raiders (take-over) or by the market itself (bankruptcy)².

The *principal-agent* theory shifts its attention on the separation between ownership and control (this latter, exercised by the management). If such an issue occurs, the managers will seek to exploit their informative advantage for the maximisation of slacks rather than profit. In this context, a private ownership is considered to be able to reduce the moral hazard issue (Bös, 1991; Martin and Parker, 1997).

The *public choice* theory's argument lies in bureaucratic behaviours by public officials. They will try to maximise their own political utility, that is the consensus of voting citizens, rather than the public interest³. In fact, the information about the actual

¹ In the literature there are also some arguments that contrast with the actual threatening of the take-over (Tirole, 1988; Vickers and Yarrow, 1988; Trento, 1992).

² Both these factors suppose that there is a strong identification between ownership and control.

³ For instance, the bureaucrats will satisfy the union's requests as largely as possible. In fact, some theoretical and empirical evidences suggest that state-owned firms results generally overmanning

internal efficiency condition is not available by taxpayers but paying high political transaction costs. In such a context, it can be included the matter of the so called *soft budget constraint*. This latter allows the publicly-owned firms to enjoy of easy subsidies from the government⁴.

2.2. Theoretical background for the pre-privatisation behaviour

In the economic literature there are numerous works relating to the perspectives of privatisation in the years following the dismissal of public assets, but few analyses focus on the effects of the announcement to both managers' or workers' behaviours before privatisation. So the theoretical framework draws necessarily from the traditional explanation models discussed above.

Vickers and Yarrow (1988) suggest that the capital market discipline through take-over can result in an uncertain effect upon the internal efficiency of the target firms. It depends on the expectations of the managers. Let x be the effort level, $U(x)$ the managerial utility as negative function of the effort (so that $dU/dx < 0$). Assume further that the probability that take-over occurs in the period between t and $t+dt$ is $h(x, \theta)dt$ (with $dh/dx < 0$), where θ is an outside parameter capturing the elasticity of take-over likelihood to changes in effort. The present value of the expected utility for the management (assuming the discount rate be r) is:

$$\int_0^{\infty} U(x) \exp[-(r+h)t] dt = \frac{U(x)}{r+h(x, \theta)} \quad [2.2.1]$$

Maximising this expression with respect to x and equalling to 0, it can be obtained the following first-order condition:

$$\frac{dU/dx}{U} = \frac{dh/dx}{r+h(x, \theta)} \quad [2.2.2]$$

This latter equation states that at the optimal level of effort the marginal increase in managerial utility is equal to the marginal increase in the present value of the probability of becoming a take-over victim. This latter equilibrium condition is depicted in figure 2.2.1 by the x^* .

(Pint, 1991; Boycko, Shleifer and Vishny, 1996; Dewenter and Malatesta (1998); but for a contrasting opinion, Megginson, Nash and Van Randenborgh, 1994).

⁴ As shown by the empirical results of Bertero and Rondi (2000), the passage from a soft to a hard budget constraint system leads to a more careful use of the resources by the management. The hardening of the budget control by the government is, however, quite difficult (Schmidt, 1996).

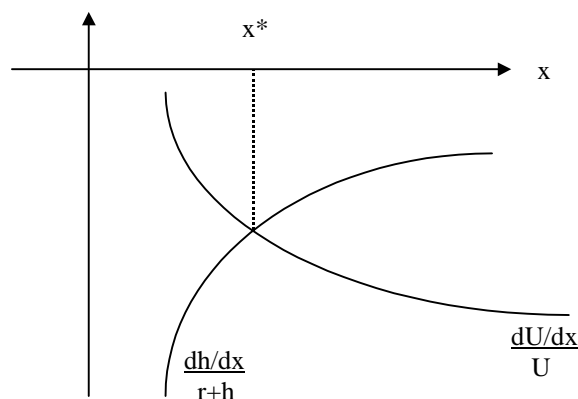


Figure 2.2.1 Take-over threats and managerial effort (Vickers and Yarrow, 1988, p. 20)

To assess the lonely impact of tightening conditions in the market for corporate control, it can be considered a change in the parameter θ . If θ increases, reflecting a harder market discipline, the implications for the inside efficiency are not unambiguous. Indeed, a higher value of θ raises the denominator in the expression on the right-hand side of (2.2.2), then shifting upwards the corresponding curve. Nevertheless, a greater take-over threat is naturally expected to enhance the probability of take-over for any given level of effort, so shifting the curve downwards. Thus, the equilibrium point x^* move on the right or on the left, according to the prevailing effect. Intuitively, a greater fear of take-over can induce the most shirking managers (that will be more likely laid-off by the new shareholders) to improve their discount rate, $r+h(x, \theta)$, and seek to maximise their utility as long as they are in the control of the firm. On the other hand, the most capable managers (that will probably maintain their office into the firm) will try to accrue the control of efficiency because they perceive that any relaxing will be punished more heavily by the market. This pattern suggests that a more active market for corporate control may lead even to adverse selection solutions associated with lower internal efficiency.

It can be noted that the role of expectations is not of secondary importance because both the types of managers anticipate their future perspectives into the firm. To our aims, it can be possible to substitute the actual θ with its expected value θ^e , observed by the public managers themselves⁵, without losses in the meaning of this pattern.

The authors in their work have developed an analogous model with respect to bankruptcy risk. In this case, the first-order condition will be:

⁵ The role of expectations of public managers is highlighted by Aghion, Blanchard and Burgess (1994) and by Riechmann (1996), whose arguments will be discussed later.

$$\frac{dU/dx}{U} = \frac{F'(d\pi/dx)}{r + F(D - \pi)} \quad [2.2.3]$$

where $F(D - \pi)$ is the probability function of bankruptcy that depends on the spread between the level of debt (D) and the market value of the firm ($\pi(x)$). When the risk of economic collapse of the firm raises, particularly if the industry experiments with periods of recession or more intensive product market competition, the effect on the internal effort will be again ambiguous. Once more, the expected increasing in the probability of going out of business could be anticipated by the officials of state-owned firms before privatisation, especially if the public sector underwent restructuring or liberalisation processes by policy makers. As a support of the positive impact of the financial pressures on state-owned firms, Bertero and Rondi (2000) show that a passage from a soft to a hard budget constraint, in the Italian public context, implied increase in total productivity and reduction in employment used. The role of soft budget constraint is particularly active when considering small public firms that compete with small private firms (Kay and Thompson, 1986). In such a context, the presence of easy subsidies from the government to state-owned enterprises can work as a strong alteration of the competitive system, with negative consequences on the efficiency performances of these latter (Schmidt, 1996; Trento, 1992).

These arguments show the consequences of environmental changes on the probable behaviour of managers of public firms. Moreover the provided explanations do not treat thoroughly the factors conditioning the choice of managers about their effort. With regard to this issue, Aghion, Blanchard and Burgess (1994) have studied the incentive schemes working when the public managers have to decide about the opportunity of restructuring and unbundling before privatisation occurs. They found that the perspective of job loss in the future and poor payment systems not based upon economic results (i.e., no reservation to the managers of stakes in the privatised companies) represent strong disincentives for restructuring process. Their base model focuses on the alternative choice between restructuring or maintaining the status quo and develops over an horizon of two periods. Furthermore, they suppose that both strategies are implemented by acting on the employment level⁶.

The status quo strategy is associated with employment equal to N in the first period and to $N(1-y)$ in the future period (due to a loss in competitiveness), with $y > 0$. At contrary, the restructuring/unbundling strategy means a labour shedding in the current period followed by a recovery in the employment level in the future period. The final result is equal to $N(1-x+z)$ where $x > 0$ and z can assume two values corresponding to the

⁶ The utility function of public managers is supposed be correlated with the employment level, because this latter could be interpreted as a synonym of prestige (Pint, 1991).

(bad and good) states of the world: \underline{z} and z both with probability 1/2. According to the authors, under these assumptions, the restructuring option will be socially convenient if the amount of employment on both the two periods exceeds the overall workforce in the case of status quo, thus if:

$$N(2 - 2x + E(z)) > N(2 - y) \quad [2.2.4]$$

or equivalently:

$$E(z) > 2x - y \quad [2.2.5]$$

When introducing an horizon of privatisation, the public managers will be more prudent in committing themselves in restructuring process because they could not witness the results of their effort. Indeed, privatisation could break off their contract with the state firm before restructuring shows its beneficial consequences. Let λ be the probability that privatisation takes place between the current and the future period, the optimal rule for undertaking restructuring becomes as follows:

$$E(z) > ((2 - \lambda) / (1 - \lambda))x - y \quad [2.2.6]$$

As can be seen, if $\lambda=0$, that is if privatisation will occur after restructuring has produced its outcomes, the (2.2.6) turns out to be equal to the (2.2.5). Instead if $\lambda=1$, the incentive is definitely shifted towards the status quo strategy. In summary, as higher the likelihood coefficient λ as stronger the willing of not restructuring will be, even if a restructuring project would be socially optimal⁷. The main intuition underlying this model is that, if the horizon of privatisation for the management is long enough, through restructuring the (good) manager reveals to the market his ability and will be more likely to be offered a better job elsewhere. At contrary, if this horizon is too short, then the market will not be able to evaluate which share of the future efficiency gain can be assigned to the manager's action⁸. These arguments suggest that active behaviours from public officials depend upon how the policy makers plan the timing of privatisation, the

⁷ When introducing into the pattern the possibility for the managers of gaining a share a of the newly-privatised firm, and supposing that λ assumes a positive value, the authors demonstrate that the good managers are once more biased against restructuring even where this latter would be socially optimal. Moreover, it can be shown that the workers play a role counteracting the restructuring choice. In fact, they care about solely their current employment and not the perspectives linked to parameter z . If the restructuring is uncertain enough, the workers will surely hinder that that project takes place. However a passage from a soft to a hard budget constraint for those firms that maintain the status quo, improve unambiguously the probability that restructuring occurs (Aghion, Blanchard and Burgess, 1994).

⁸ Siebert (1994) argues that the restructuring policy can not be supported solely by incentive mechanisms on managerial activity, but needs also new capital.

actual expectations of managers⁹, the composition of the managerial teams¹⁰ (Estrin, 1994), other than the organisational structures of the firms.

Riechmann (1996), developing the previous pattern, has studied the possibility of pre-privatisation restructuring by applying a game method. According to Riechmann, restructuring of publicly-owned firms is possible after the announcement of the intention of privatisation by the government. Its extent, however, depends upon the expectations of public managers about the level of subsidies that the policy makers will grant in the future for sustaining the employment¹¹. Soft budget constraints can thus hinder the increase in efficiency before privatisation takes place, because of the maintenance of status quo. A more credible commitment of the government can lead the firms to prefer restructuring strategy, for instance, by a faster transaction towards privatisation or by a more thorough change in organisational status.

The consequences of privatisation or changes towards more profit-orientated objectives on employment and wages are discussed in Haskel and Szymanski (1993b) by a bargaining model that considers the managers/workers relation. Their results, obtained considering especially public utilities, suggest that shifting towards private ownership or changes in objectives into the public sector lower employment and wages. The former effect is due to a reduction in output level that follows a sharper orientation towards commercial aims (but such a shrinkage is upset by a possible reduction in market power, that frequently is associated with privatisation policies). The latter effect is associated with a reduction in the surplus¹² over which the unions bargain and a decreasing care the government puts on the unions' power (such a condition is fed by the potential liberalisation effect). It can be assumed that the consequences of changes in strategic objectives of publicly-owned firms follow the announcement of privatisation, so that there is the matter for a pre-privatisation increase in internal efficiency.

Another reason that could explain an increasing efficiency before privatisation occurs is related with the exigencies of public finance (Jones, Tandon and Vogelsang, 1990). The government is naturally oriented to maximise the value of the assets sold to the private investors. If the financial market is well-functioning, it will translate the

⁹ In such a context becomes relevant the role of credibility of the commitment of government. If the credibility were quite weak, an issue of time-inconsistency would arise (Riechmann, 1996).

¹⁰ This means that the signalling role of the managerial capacity to the market will be more intense the greater the percentage of good managers into the command teams.

¹¹ The Riechmann's hypothesis is that the government can choose between the strategy of announcing a privatisation programme and then continuing to subsidise the public firms that do not restructure or applying a total hard budget constraint with no grant of subsidies. The first solution is the dominant one.

¹² This surplus has to be interpreted as the capacity of the firm of paying its workers, that is available funds.

perspectives of increasing in performances into the present prices of shares. So restructuring processes before privatisation, by public officials, can be induced by the government itself, for giving the firm a better strategic position when it will work without state protections.

3. Empirical framework

The aim of this work is to evaluate the impact of the threat of the privatisation programme on the productivity dimension, in particular before the dismissal itself takes place. There is some evidence from the British context that the government picked out for privatisation those public firms that already experienced a growing performance (Villalonga, 2000). In this way is uncertain if the increase in efficiency can be consider as exogenous or, alternatively, is due to the announcement of privatisation. Bertero and Rondi (2000), although in a different context, have demonstrated through an analysis of a panel of Italian public firms, that when a shift from a regime of soft to one of hard budget constrain takes place, the managers became more aware in avoiding drops in productivity, as well as more sensitive to the financial debt variable. In particular there is evidence of a strong reduction in work-force levels. This fact arises the question about the capacity of the public firms of reducing inefficient utilization of their resources. These results are in accordance with Fraquelli and Erbetta (2000) who showed an increasing trend in efficiency DEA scores before privatisation, for medium-sized Italian privatised manufacturing firms, attributable, in first instance, to large cuts in employment dimension. Another evidence of consistent correction in labour input factor is included in Fraquelli and Fabbri (1998).

Villalonga (2000), in a longitudinal study of 24 Spanish firms, presents an estimated model in which the hypothesis of relevance of time period on the effects of privatisation on efficiency is tested. In fact, the results emphasize an increase in efficiency for years 7 and 8 after privatisations as well as a reduction in previous years 5 and 6. The same analysis highlights a significant recovery in efficiency in years 3 and 4 before privatisation, even if a similar behaviour is not noted for the years closer to privatisation. A stronger evidence of such an outcome is proposed by Fraquelli (2001), again on the Italian case. When analysing, by the use of Törnqvist indices of total factor productivity (TFP), the author reveals increasing performances in the years preceding the privatisation. This latter outcome is explained, in according with theoretical observations, by a weaker interference of political bureaucracy and especially by a

sharper risk, perceived by public managers, of job loss¹³. This fact leads public officers to reveal their actual capacity, in such a way as to qualify themselves onto the labour market. An externality mechanism can play a positive role in the increasing of efficiency of the firms under privatisation, insofar as it makes feasible the reduction of inefficiency slacks due to asymmetric information.

These outcomes emerging from the Spanish and mainly Italian market are somewhat confirmed by the British experience. The UK can be considered as the country where the policy of privatisation has been carried out in a radical manner during the '80s and '90s. So the comparison with this reality becomes fundamental and inevitable for each research of this type. Parker and Martin (1995) in analysing 11 firms transferred from public to private control in the UK over the '80s show that the run-up of privatisation is associated with improvement in total and mainly in labour productivity. This work complements earlier findings of Molyneaux and Thompson (1987), Vickers and Yarrow (1988), Hutchinson (1991), Bishop and Thompson (1992). The fact that the performance increases markedly before privatisation suggests the question of feasible incentive schemes even under public control.

4. Settlement of the sample and dataset

The data used for the estimation are directly extracted from the balance sheets of 23 large Italian firms, partially or totally privatised over the last decade, and collected in an unbalanced panel covering the period from 1983 to 1998, for a total number of 350 firm-year observations. While the final period of the time series is common to the entire sample, the initial one differs across the firms¹⁴. Company names, years of privatisation and length of each time series are reported in table 1. All the data used for the econometric model were deflated to the 1983. The choice of both beginning the series and utilising the price system at 1983 year depends on the fact that in the analysed period all the firms of the sample were subjected to revaluation of the stock of fixed asset and depreciation fund, on the basis of the law 72/1983. This latter allows for considering the balance fixed asset values of this year as reliable starting points for building up deflated physical capital time series.

¹³ This aspect can be viewed as a possible consequence of a regime of harder budget control.

¹⁴ When the companies underwent mergers or acquisitions so as to make impossible any comparison between the preceding and subsequent time series, the time period was opportunely truncated in such a way as to render homogeneous the accounting data.

Table 1 – List of firms of the sample ^(a)

COMPANY NAME	PRIVATISATION YEAR ^(b)	TIME SERIES
CEMENTIR	1992	1983-98
ENEL	1999	1983-98
AUTOSTRADA	1999	1983-98
FINMECCANICA	1999	1990-98
ACEA	1999	1987-98
AEROPORTI DI ROMA	1999	1983-98
AEM MILANO	1998	1983-98
AEM TORINO	2000	1983-98
NUOVO PIGNONE	1994	1983-98
MONTEFIBRE	1996	1986-98
SNAM	1996	1983-98
AUTOGRILL	1995	1983-98
ALITALIA	1998	1983-98
ANSALDO	1990	1983-98
AMGA GENOVA	1996	1987-98
TELECOM	1999	1983-98
ITALDATA	1985	1983-98
RECORDATI	1985	1983-98
STAR	1985	1983-98
TIRSOTEX	1988	1983-98
SIV	1993	1983-98
TUBI GHISA	1993	1983-98
ALCANTARA	1994	1983-98

(a) All the monetary figures are deflated in 1983 pounds, even for those firms whose time series begin after 1983 (ACEA, 1987; AMGA, 1987; FINMECCANICA, 1990; MONTEFIBRE, 1986)

(b) The years refer on the begin of privatisation programme.

The selection of the variables and the respective techniques of deflation will be briefly commented in the present section. More precise details can be found in the appendix A at the end of this paper.

Turnover output measure was calculated by multiplying physical dimensions of output by a base 1983 price. For the labour input was used the number of workers in every year, while materials and services were obtained applying to the accounting values industry-specific producers' price indices (three digit). For the capital input much problems arise. It has been considered a flow indicating the participation cost to production. With regard to the deflation process of the fixed asset stock and of the depreciation fund, it has been adopted the perpetual inventory method, applying accurate estimates of the average depreciation percentage and the rate of reward for physical and financial capital (see appendix A).

As control variables, industry business cycle and average size of the firms have been used (Nickell, 1996). The cycle measure has been obtained by considering the index number, with basis 1983, of the industry gross product. The size has been calculated as the number of workers for the first year of the time series in each firm.

This approach tends to consider the different impact of the initial conditions in terms of dimension and can be interpreted as an explained fixed effect.

5. The econometric model

The basic hypothesis of this work is that an improvement in productivity can be occurred before actual privatisation takes place, in the so called run-up period. This fact can be due to a substantially shift in the incentive mechanism that regulates the management activity, as shown in the first section of this work.

Using a panel of Italian large firms, the intent is to estimate a Cobb-Douglas production function with constant returns to scale (CRS). Successively this restriction will be relaxed. In particular this study refers on the econometric model contained in the empirical works of Nickell, Wadhvani and Wall (1992), Nickell (1996) and Nickell, Nicolitsas and Dryden (1997). A similar model was adopted by Bertero and Rondi (2000) for the Italian case, with the aim of analysing the impact of financial pressure on the performance of public firms under a harder budget control regime.

The basic model in the log-linear form is:

$$y_{it} = \alpha_0 + \alpha_i + \beta^L n_{it} + \beta^C c_{it} + (1 - \beta^L - \beta^C) k_{it} + \gamma_1 cicl_{jt} + \gamma_2 size_i + \delta_1 time_t + \delta_2 ANTEPRIV_{it} + \delta_3 POSTPRIV_{it} + \varepsilon_{it} \quad [5.1]$$

where α_0 is a constant common to all the observations, α_i is the general specific-firm effect, y_{it} is the log of real sales, n_{it} is the log of employment, c_{it} is the log of the real cost of materials and services, k_{it} is the log of real capital cost, i is the firm subscript, t is the time subscript, $cicl_{jt}$ is the business cycle of the j -th industry, which the i -th firm belongs to, $size_i$ is the fixed dimension variable, $time_t$ captures the time effect interpreted as technical progress, for each period, and is represented by series of integer values from 1 to T_i ¹⁵. In order to consider the pre-privatisation and the post-privatisation effects, two dummies variables have been inserted, *ANTEPRIV* and *POSTPRIV*. The former assumes value 1 for the four years preceding the change of ownership¹⁶ (0 otherwise)¹⁷, while the latter assumes value 1 for all the years subsequent the

¹⁵ Obviously, the integer value 1 is associated only to 1983 as well as 2 is associated to year 1984. In this way the estimate takes into account the nature of unbalanced panel.

¹⁶ This choice of four years is justified by the structure of the dataset and by practical reasons. As asserted by Parker and Martin (1995), p. 207, "The decision to take four years averages was determined by the need to smooth out years of atypical performance, while at the same time avoiding long periods when performance changes could be affected by other factors than privatisation".

¹⁷ A model with an anticipation effect over 3 years was as well conducted, providing similar results.

privatisation. These two dummies capture the structural shifts in performance levels, relative respectively to the periods before (*ANTEPRIV*) and after (*POSTPRIV*) privatisation.

In a second phase, the interacted variables $time_t * ANTEPRIV$ and $time_t * POSTPRIV$ have been considered. While the first model allows only for a structural change on the constant term, the second one is more general since it permits of pointing out changes in the dynamic of the productivity. For instance, if the coefficient of $time_t * ANTEPRIV$ or $time_t * POSTPRIV$ is positive, this will mean that productivity increases over time more markedly respectively in the run-up period or in the post-privatisation period than otherwise. On the contrary, negative coefficients indicate that the performance increases less, over time, in the periods considered, or even declines. Furthermore, a comparison between the coefficients of the two interaction variables is made possible so as to check which time period prevails in term of performance trend.

Finally, labour input has been considered with more care because of its importance in improving productivity, as demonstrated in many empirical and theoretical papers focused on comparison between public and private control (Fraquelli and Erbetta, 2000; Fraquelli, 2001, for the Italian context). First, some descriptive statistics are computed with regard to the evolution of labour productivity across the three time periods: State control, run-up of privatisation (four years before privatisation)¹⁸ and post-privatisation. Afterwards, econometric estimates are presented seeking to capture the variation in output-employment elasticity over the investigated phases. The model, with CRS restriction, successively dropped, is as follows¹⁹:

$$y_{it} = \alpha_0 + \alpha_i + \beta^L n_{it} + \delta_2 n_{it} * ANTEPRIV + \delta_3 n_{it} * POSTPRIV + \beta^C c_{it} + (1 - \beta^L - \beta^C) k_{it} + \gamma_1 cicl_{jt} + \gamma_2 size_{it} + \delta_1 time_t + \varepsilon_{it} \quad [5.2]$$

The interacted variables $n_{it} * ANTEPRIV$ and $n_{it} * POSTPRIV$ allow the output-employment elasticity to vary across the three periods identified.

6. Results

The main results are presented in table 2. In order to provide some test of robustness, alternative models are specified. In column (I) a basic specification is

¹⁸ The same statistics were controlled using a run-up limited to three years. The results are substantially identical.

¹⁹ The model was estimated with an anticipation effect over 3 years, providing similar results.

presented without interacted variables and with CRS restriction. In column (II) the same model is estimated using a two way fixed effects panel technique, that is firm-specific and time-specific terms²⁰. The basic equation is treated by relaxing the Cobb-Douglas CRS restriction in column (III). In column (IV) interacted variables are added with CRS hypothesis, while in column (V) this hypothesis is dropped. Columns (VI) considers the same model as in column (IV) excluding business cycle and size. As shown below these control variables are not statistically significant.

All the production factors labour (n_{it}), materials (c_{it}) and capital (k_{it}) have, as expected, positive coefficients and are statistically significant at 1% level, in each specification of the model. Business cycle and fixed size show very insignificant parameters. Thus, these control variables seem to play no role in the definition of productivity. With regard to this evidence the final column of table 2 drops their explanatory function. The time effect, as proxy of technical progress, is highly significant at 1% level and assumes values of about 2%. This result is certainly rationale, especially when dealing with long time series such these used in this work.

The main focus is oriented to studying the anticipation effect of privatisation, as opposed to the more usual comparison between the periods before and after change of ownership. Some theoretical arguments and empirical studies, both for the Italian and foreign cases, shed light on feasible improvement of productivity in the run-up of privatisation or when the constraint regime shift from a soft to a hard form. The outcomes collected in table 2 underline positive and quite stable coefficients for the ownership dummy *ANTEPRIV*, ranging from 5% to 9%. The estimates are also statistically significant at 5% or 10%. So the years immediately before privatisation seem to considerably affect the performance level. *POSTPRIV* dummy even assumes positive values of about 4% but they are not statistically significant. No significance is, finally, associated with the interacted variables, so demonstrating a substantial invariance in productivity trends across the different phases here considered.

²⁰ The fixed effects technique is adopted since there is no reason to assume that the regressor is uncorrelated with firm-specific effects.

Table 2 – Estimates of the Productivity Equation 1
Dependent variable: y_{it}

INDEPENDENT VARIABLE	BASIC EQUATION	TWO WAYS FIXED EFFECTS	BASIC EQ. DROP OF CRS RESTR.	INTERACTED VARIABLES	INTERACTED VARIABLES DROP OF CRS RESTR.	INTERACTED VARIABLE EXCLUDING CYCLE AND SIZE
	(I)	(II)	(III)	(IV)	(V)	(VI)
n_{it}	0.215 (***) (4.748)	0.203 (***) (4.411)	0.172 (***) (2.875)	0.210 (***) (4.568)	0.163 (***) (2.710)	0.210 (***) (4.593)
c_{it}	0.666 (***) (25.447)	0.669 (***) (24.964)	0.664 (***) (25.344)	0.667 (***) (25.167)	0.666 (***) (25.129)	0.666 (***) (25.308)
k_{it}	0.119 (***) (3.447)	0.128 (***) (3.649)	0.113 (***) (3.250)	0.123 (***) (3.398)	0.114 (***) (3.110)	0.124 (***) (3.465)
$cicl_{jt}$	-0.0003 (0.501)	-0.0001 (-0.268)	-0.0002 (-0.365)	-0.0002 (-0.407)	-0.0002 (-0.297)	
$size_i$	-0.000004 (0.114)	-0.000003 (-0.098)	-0.000004 (-0.127)	-0.000008 (-0.243)	-0.000009 (-0.262)	
time	0.019 (***) (5.019)		0.018 (***) (4.943)	0.019 (***) (4.324)	0.020 (***) (4.395)	0.019 (***) (4.618)
ANTEPRIV	0.045 (**) (1.994)	0.041 (*) (1.746)	0.044 (**) (1.952)	0.089 (*) (1.850)	0.094 (**) (1.944)	0.088 (*) (1.840)
POSTPRIV	0.041 (1.134)	0.043 (1.121)	0.035 (0.958)	0.049 (0.720)	0.057 (0.830)	0.046 (0.677)
$time_t * ANTEPRIV$				-0.005 (-0.994)	-0.005 (-1.148)	-0.004 (-0.972)
$time_t * POSTPRIV$				-0.0005 (-0.094)	-0.002 (-0.333)	-0.0001 (-0.024)

The estimates relative to the constant term are omitted, but these are in most cases significant.
t-statistics are presented in round brackets.

(*) Statistically significant at the 10% level

(**) Statistically significant at the 5% level

(***) Statistically significant at the 1% level

All final results remain unchanged if the CRS Cobb-Douglas restriction is dropped out, as shown in columns III and V in table 2.

When concentrating on labour productivity, table 3a highlights, as in earlier empirical investigations, an upwards shift over the years preceding privatisation, and a decline in the following period. The greater labour productivity in the second period considered is associated with a higher standard deviation, so revealing a reorganisation effort, characteristic of such a period of transition. Table 3b, instead, collects the estimates of the Cobb-Douglas production function (2). Column (I) uses a basic model in which CRS is imposed, column (II) relaxes this constraint. When observing the basic equation, the coefficient of $n_{it} * ANTEPRIV$ appears slightly higher than that of $n_{it} * POSTPRIV$, the former being significant at 5% level. There is, thus, an evidence of greater elasticity over the run-up phase. In order to interpret these outcomes, some difficulties arise. The elasticity term is well-demonstrated that can be written as:

$$\beta_h^L = \frac{\partial Y_{it}}{\partial N_{it}} \bigg/ \frac{Y_{it}}{N_{it}} \quad [5.3]$$

with $h=1, 2, 3$ indicating the three temporal stages described above, and the capital letters stay for original values of real sales and employment. The numerator is the marginal product of labour, while the denominator the average product, or the labour productivity index. To the extent that β^L under pre-privatisation stage and labour productivity increase, it can be concluded that over the same period it has been achieved a technical improvement on the marginal product.

It is again worth to note the high significance of the technological regressors but the coefficient of $n_{it} * POSTPRIV$, and of the $time_t$ variable. The results remain robust if the model is estimated relaxing the CRS restriction.

Table 3a – Descriptive statistics on Labour Productivity ^(a)

	STATE CONTROL	PRE-PRIVATISATION (FOUR YEARS)	POST-PRIVATISATION
AVERAGE	211	277.42	267.92
STANDARD DEVIATION	341.82	421.48	392.69
MEDIAN	135.74	177.76	182.06
1 st QUARTILE	90.42	121.11	142.73
3 th QUARTILE	167.76	230.15	263.30

(a) Values in millions of £

Table 3b – Estimates of the Productivity Equation 2
Dependent variable: Y_{it}

Independent Variable	WITH CRS RESTRICTION (I)	Without CRS Restriction (II)
n_{it}	0.214 (***) (4.715)	0.166 (***) (2.782)
$n_{it} \cdot ANTEPRIV$	0.0054 (**) (2.036)	0.0055 (**) (2.082)
$n_{it} \cdot POSTPRIV$	0.0050 (1.091)	0.0047 (1.011)
C_{it}	0.667 (***) (25.458)	0.666 (***) (25.373)
k_{it}	0.119 (***) (3.452)	0.113 (***) (3.246)
$cicl_{jt}$	-0.00036 (-0.672)	-0.00028 (-0.524)
$size_i$	-0.000003 (-0.082)	-0.000003 (-0.098)
$TIME_T$	0.019 (***) (5.181)	0.018 (***) (5.004)

The estimates relative to the constant term are omitted, but these are in most cases significant.
t-statistics are presented in round brackets:

- (*) Statistically significant at the 10% level
- (**) Statistically significant at the 5% level
- (***) Statistically significant at the 1% level

7. Conclusion

Most of the papers in theoretical and empirical literature face the question of inter-temporal comparison between periods before and after privatisation on the basis that ownership itself can produce effects on the performances of the firms. There are, however, many evidences that highlight improvements in performance before privatisation takes actually place. This suggests that incentive mechanisms can powerfully work for state-owned firms, especially in the run-up of privatisation or after a shift into a harder budget control regime (Parker and Martin, 1995; Fraquelli and Erbetta, 2000; Bertero and Rondi, 2000).

This paper is intended to study the specific pre-privatisation behaviour of a sample of Italian large firms that underwent changes in ownership in the last decade. The main results point out a significant and positive impact on performance level along the four-three years before privatisation. While the technological factors are highly significant and of the expected sign, the control variables and the post-privatisation

dummy (*POSTPRIV*) are without statistical weight. The hypothesis of changes in productivity trends was tested with the introduction of interactions between ownership dummies and time variable. The associated coefficients are nevertheless statistically insignificant. The outcomes maintain substantially unchanged through different models and when the CRS restriction is relaxed.

Labour productivity and output-employment elasticity improve over the run-up phase, so pointing out an enhancement in marginal production. Even in this case, the results do not change when CRS hypothesis is dropped. Labour factor seems to play an important role in explaining the recovery in performance.

In conclusion, there is some evidence that in the run-up period an incentive mechanism of the bureaucratic behaviour of public officers can work. One reason can be due to the perceived threat by managerial structures of removal from their office, after privatisation occurs, so pushing these latter to reveal to the labour market their actual capacity. In this context adverse selection mechanisms play a fundamental role. Furthermore, financial market requires that the re-allocated assets are reorganised, so as to guarantee positive prospective economic values. Finally, State finances can force the management in maximising the revenues from the dismissal process.

Appendix A

All the data were drawn from the balance sheets of the firms. When the balance sheets were not available the annual report “*Le principali società italiane*”, edited by *Mediobanca*, was used as alternative source.

Output (y): physical outputs multiplied by a 1983 prices. These latter are computed by dividing the various 1983 sales by the respective quantities, for each type of output produced. Where the physical measure was not available, the accounting values were directly deflated by using appropriate industry-specific producers’ price indices, from the ISTAT classification ATECO91 (three digit).

Employment (n): number of workers for each year.

Materials and services (c): cost of materials and services deflated by a specific-industry producers’ price indices from the ISTAT classification ATECO91 (three digit). The variations in inventories are considered.

Capital (k): deflated depreciation + deflated interests paid + deflated implicit cost of capital. The deflated gross fixed assets (GFA) were obtained by the perpetual inventory method (Fraquelli, 1997) starting from the 1983 value (works in progress were included). Investments were deflated by using the general investment goods price index (ISTAT), including financial expenses for the acquisition of the plants. Dismissals are considered at 1983 pounds, due to the fixed assets revaluation law 72/1983. When a successive revaluation occurred in 1991, the real dismissals after this year were corrected by the ratio (REV): revaluated FA at 1991/(revaluated FA at 1991-revaluation at 1991). In order to calculate the real depreciation was used an average depreciation rate for every firm, as: depreciation/fixed assets. The deflated depreciation fund (DF) was built up starting from 1983. As in the perpetual inventory method the fund reductions were considered at 1983 pounds and eventually corrected by REV ratio. The Net Working Capital (NWC) is: inventories+liquidity+credits (including medium and long term credits)-liabilities (including medium and long term liabilities). Long term funds excluded. NWC was deflated by using the appropriate deflator index for inventory materials or alternatively by the general consumption price index. Financial capital was computed as: deflated GFA-deflated DF+NWC. The cost of capital was estimated as weighted average of rates of returns on equity and financial debts. For the public utilities characterised by stable demand, the estimate is of 4.4%, while for industrial firms operating in riskier environments, the estimate of 8% was adopted.

Business cycle: annual variation of the industry deflated value added (basis 1983). Specific value added deflators were used. The source of these data is ISTAT.

Size: number of employees in the first year of the time series. It remains constant over each firm.

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